

Fig. 1

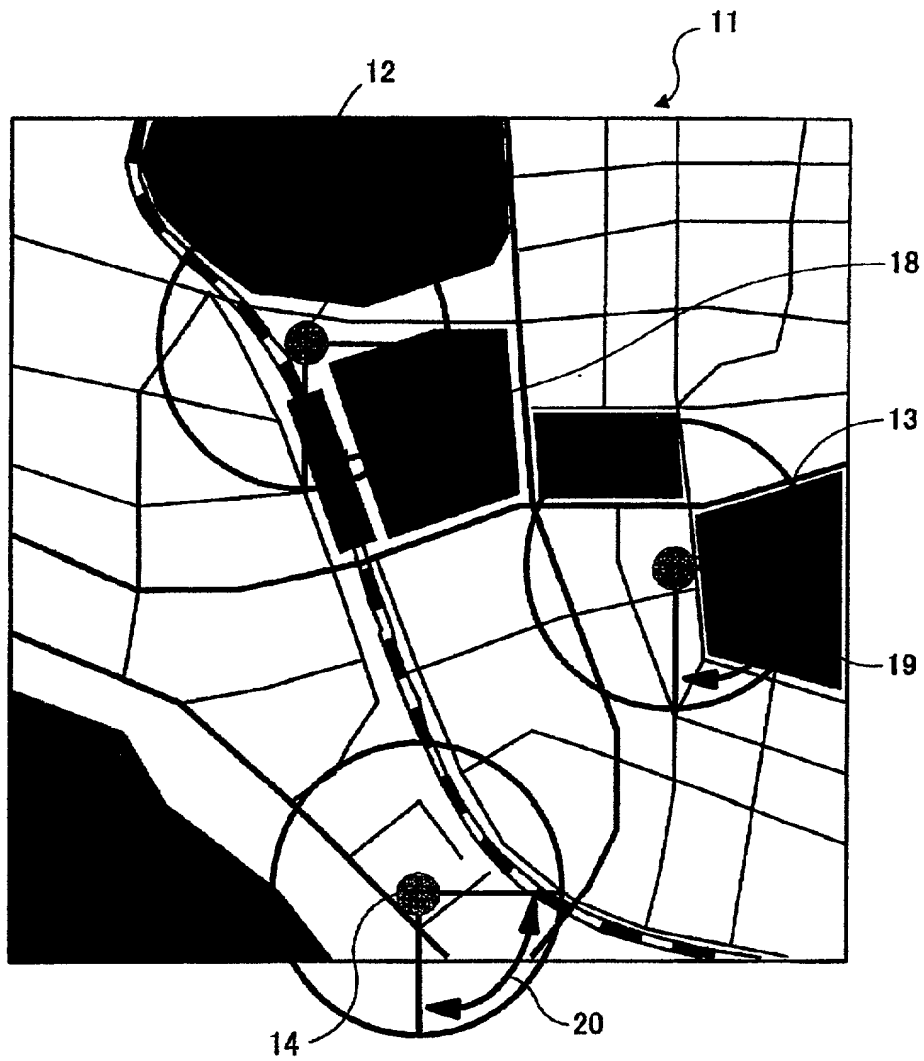


Fig. 2

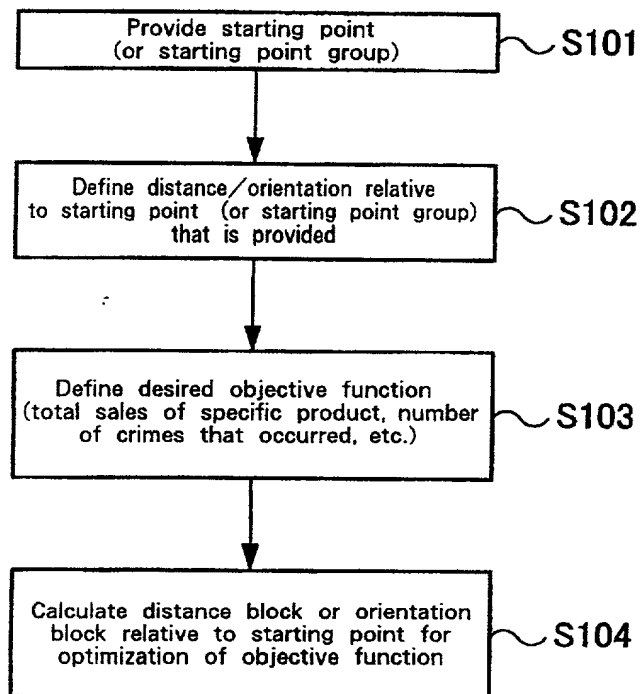


Fig. 3

Example database

Post office schema = (ID, position (coordinate), type)

School schema = (ID, position (coordinate), type)

Police station schema = (ID, position (coordinate), type)

Train station schema = (ID, position (coordinate), passenger count, transfer station or not)

Convenience store schema = (ID, position (coordinate), sales, store name)

Customer schema = (ID, position (coordinate), age, sex, annual income, occupation)

ATM schema = (ID, position (coordinate), average withdrawal, average operation times)

Crime schema = (ID, position (coordinate), type)

Numerical attribute

Categorical attribute

Fig. 4

Define starting point group for distance
and origin point group for orientation

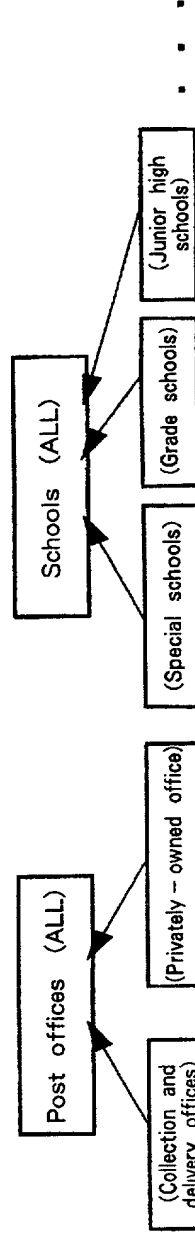
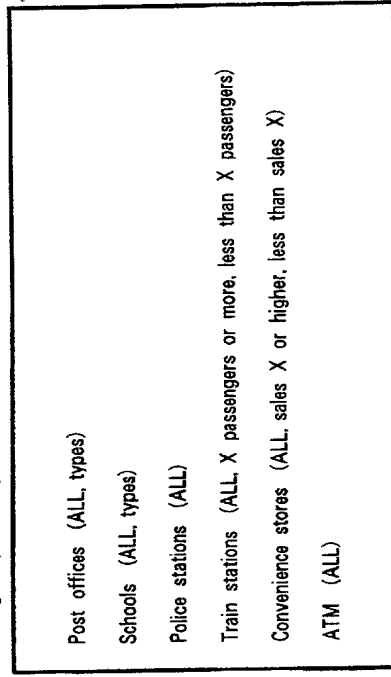


Fig. 5

Define distance/orientation

Distance

Euclidean distance

Calculate using Voronoi diagram (dissociated from substance on a map in high - speed processing or for a very short distance)

Network distance

Calculate using dijkstra algorithm (much calculation time/reflects substance on a map)

Orientation

Define orientation scale where one cycle is 360° clockwise with north being 0°

Define orientation interval using the orientation scale

Fig. 6

Define objective function

"Customer schema"
(Maximized distance for the "average annual incomes" of customers having support rate of S or higher)
"Customer schema"
(Maximized distance for customer rates of "age of 60 or older" having support rate of S or higher)
"Customer schema"
(Minimized distance for a square error of "average annual incomes")
"Customer schema"
(Maximized distance for mutual amount of "sex" information)
"ATM schema"
(Maximized distance for "ATM count/customer count" having support rate of S or higher)

—— Numerical (or derived as numerical value) attribute
—— Categorical (or derived as categorical value) attribute

Fig. 7

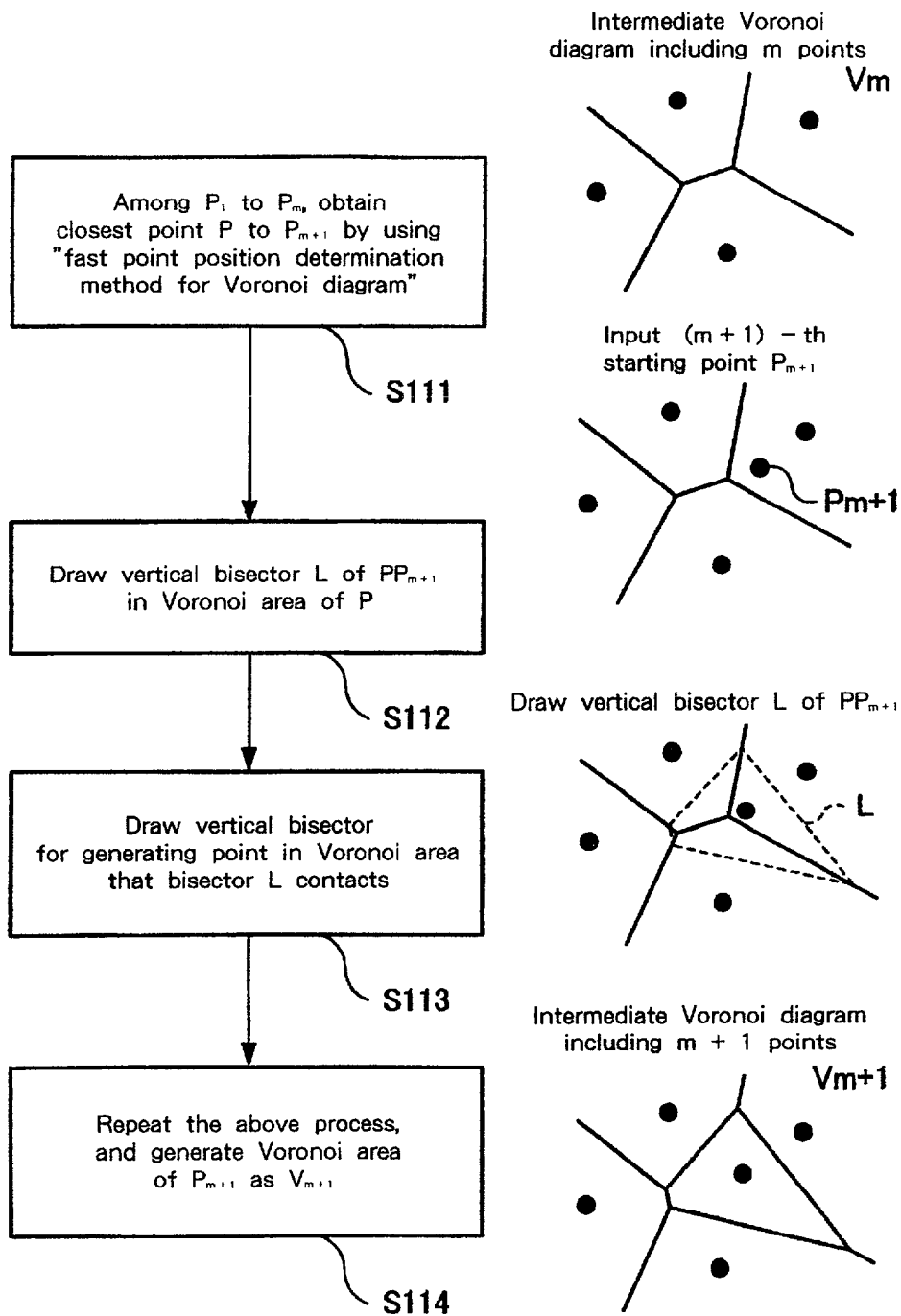


Fig. 8

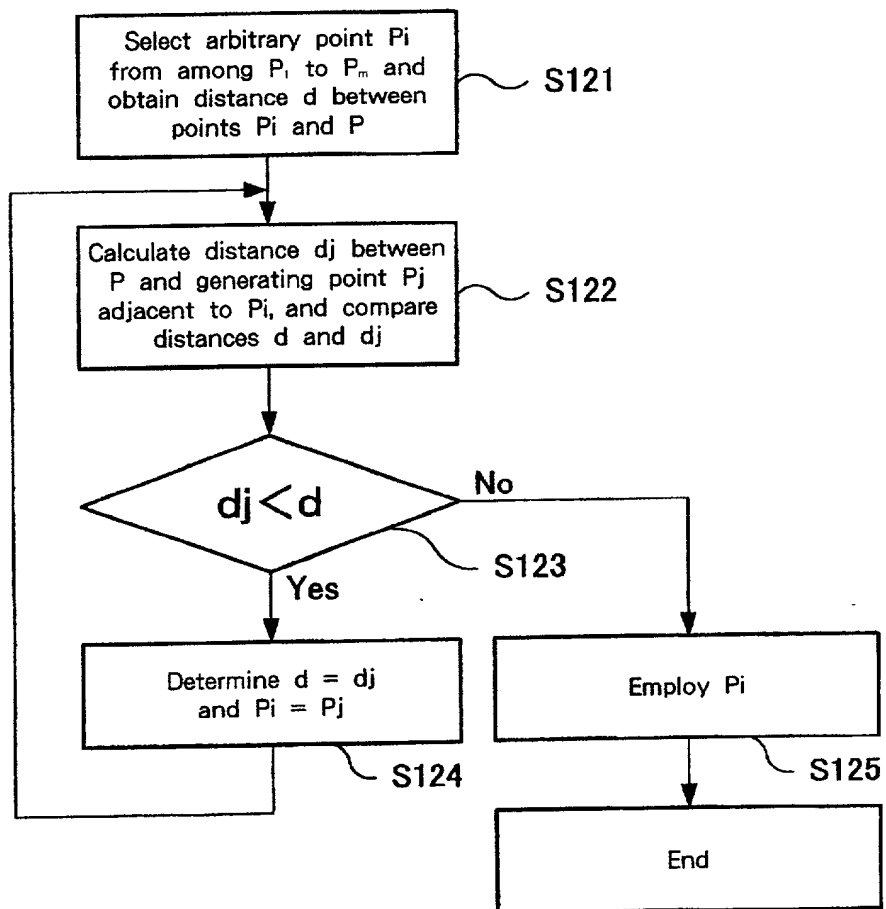
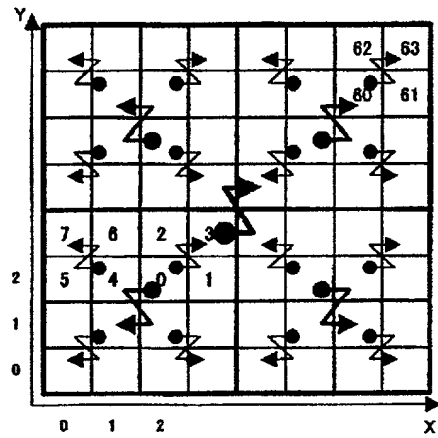
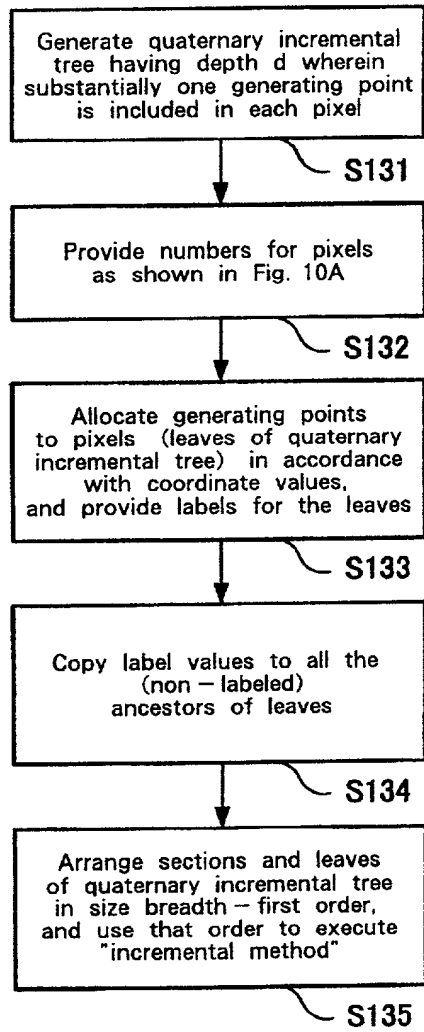
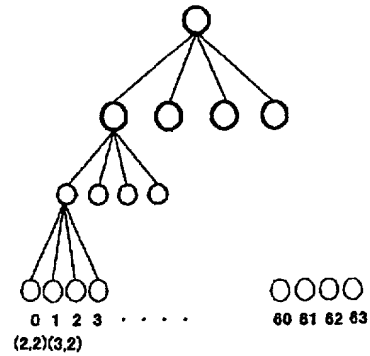


Fig. 9



(a) View of map
(two - dimensional plane)



(b) View of quaternary incremental tree

Fig. 10

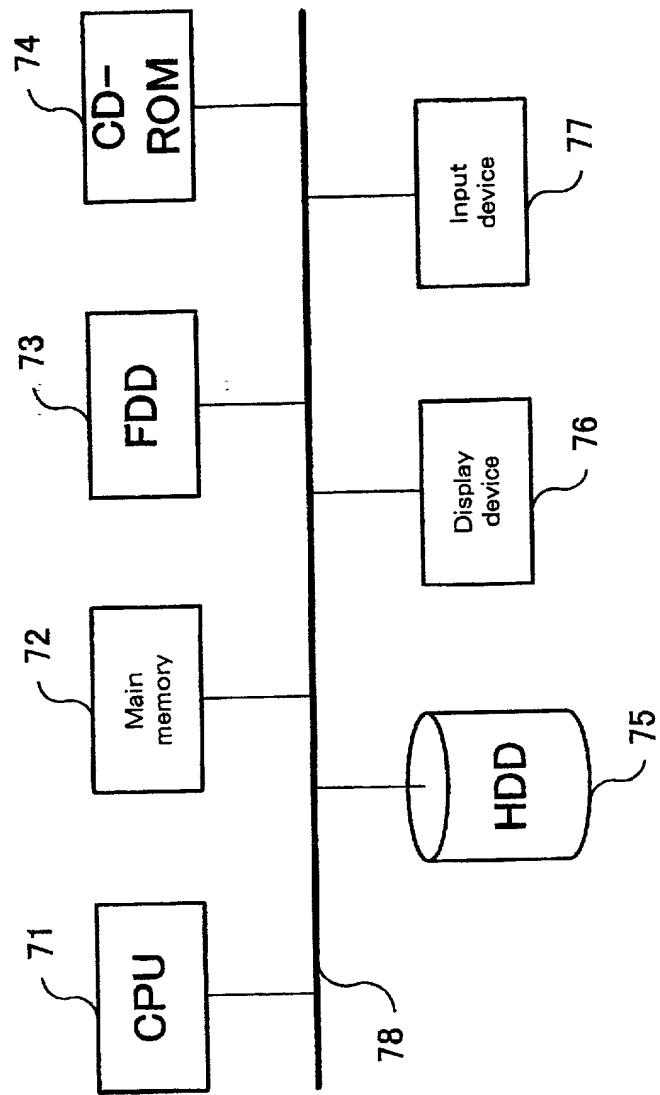


Fig. 11

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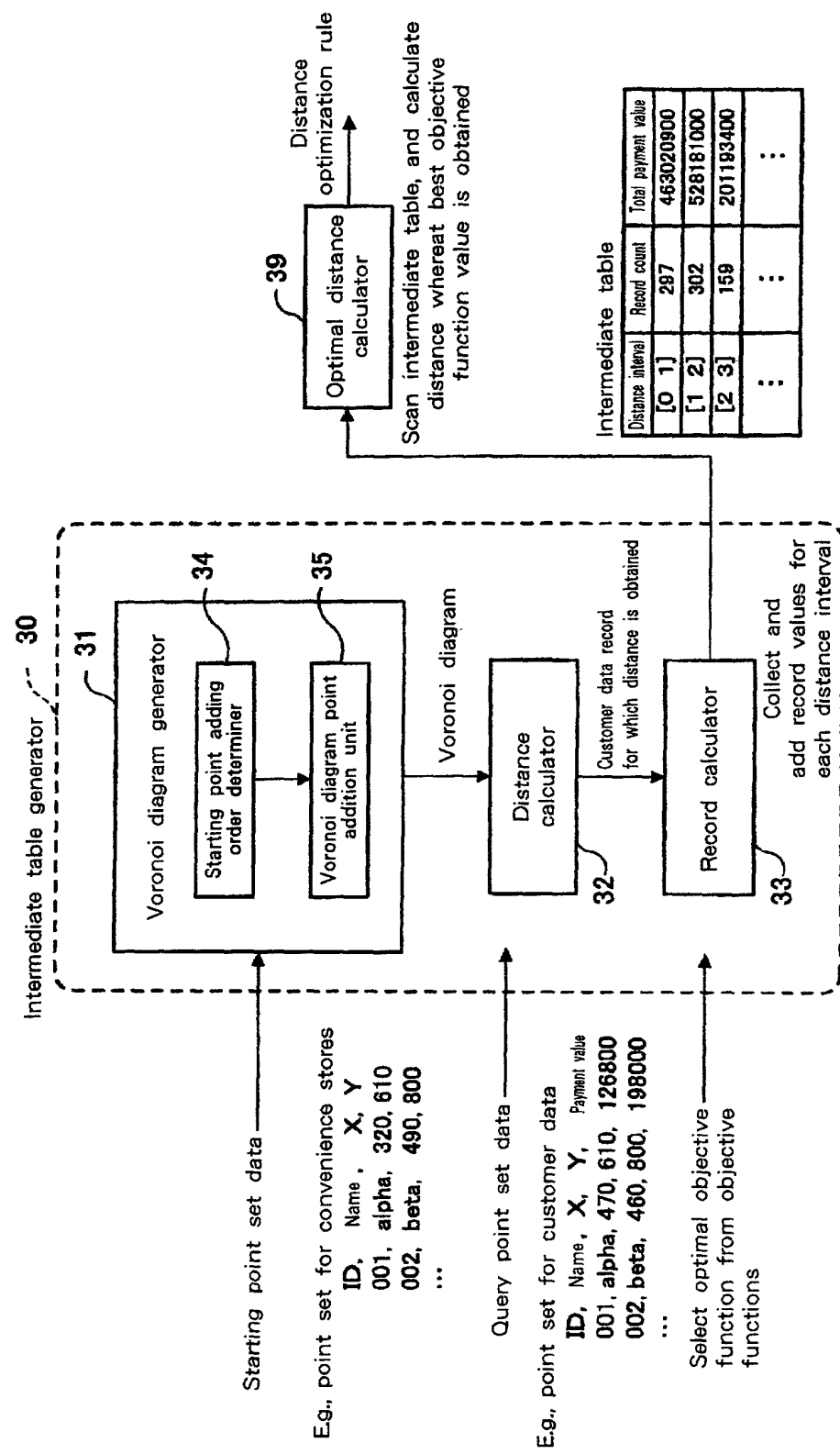
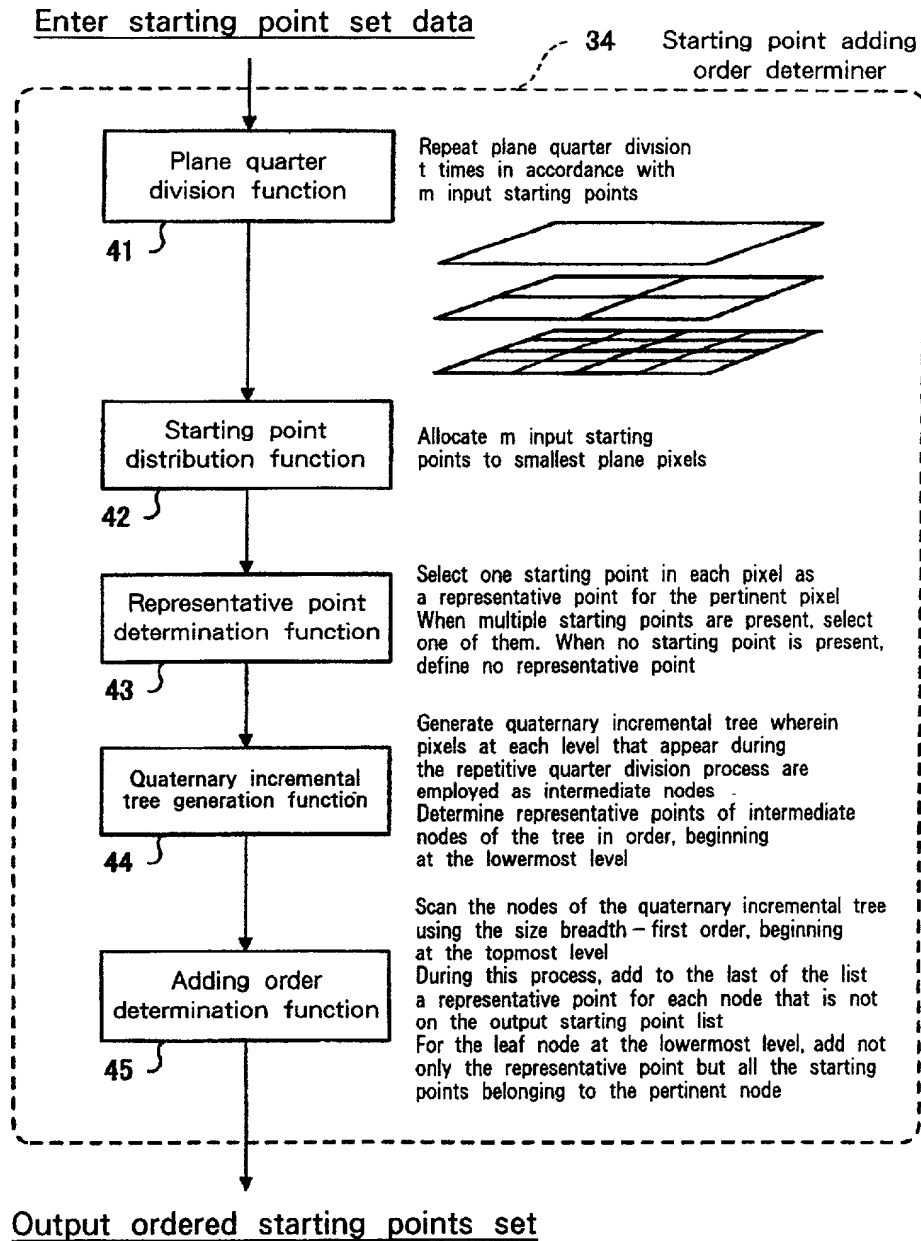


Fig. 12



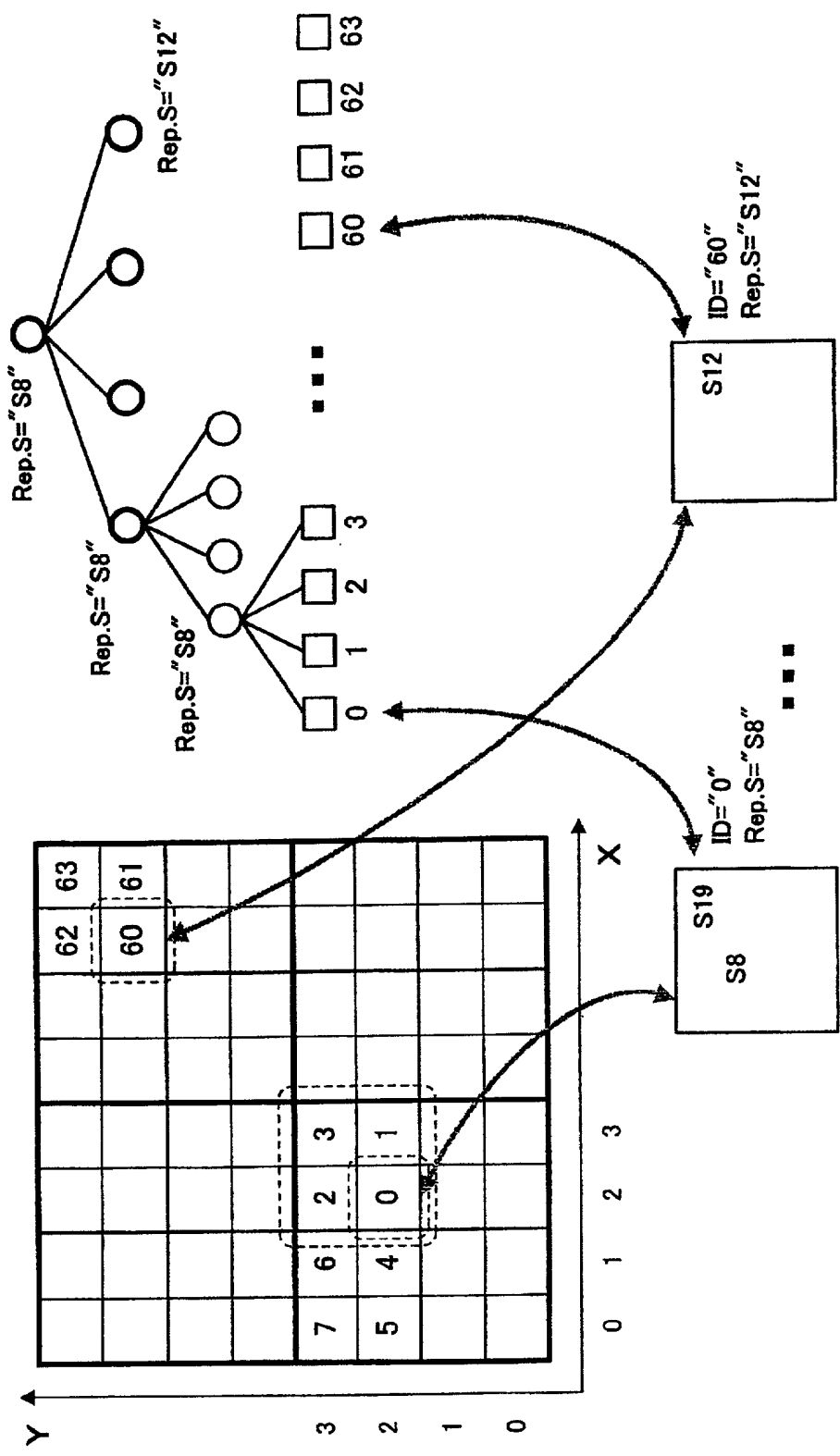


Fig. 14

Intermediate Voronoi diagram including m points

The $(m + 1)$ - th starting point

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Voronoi diagram
point addition unit

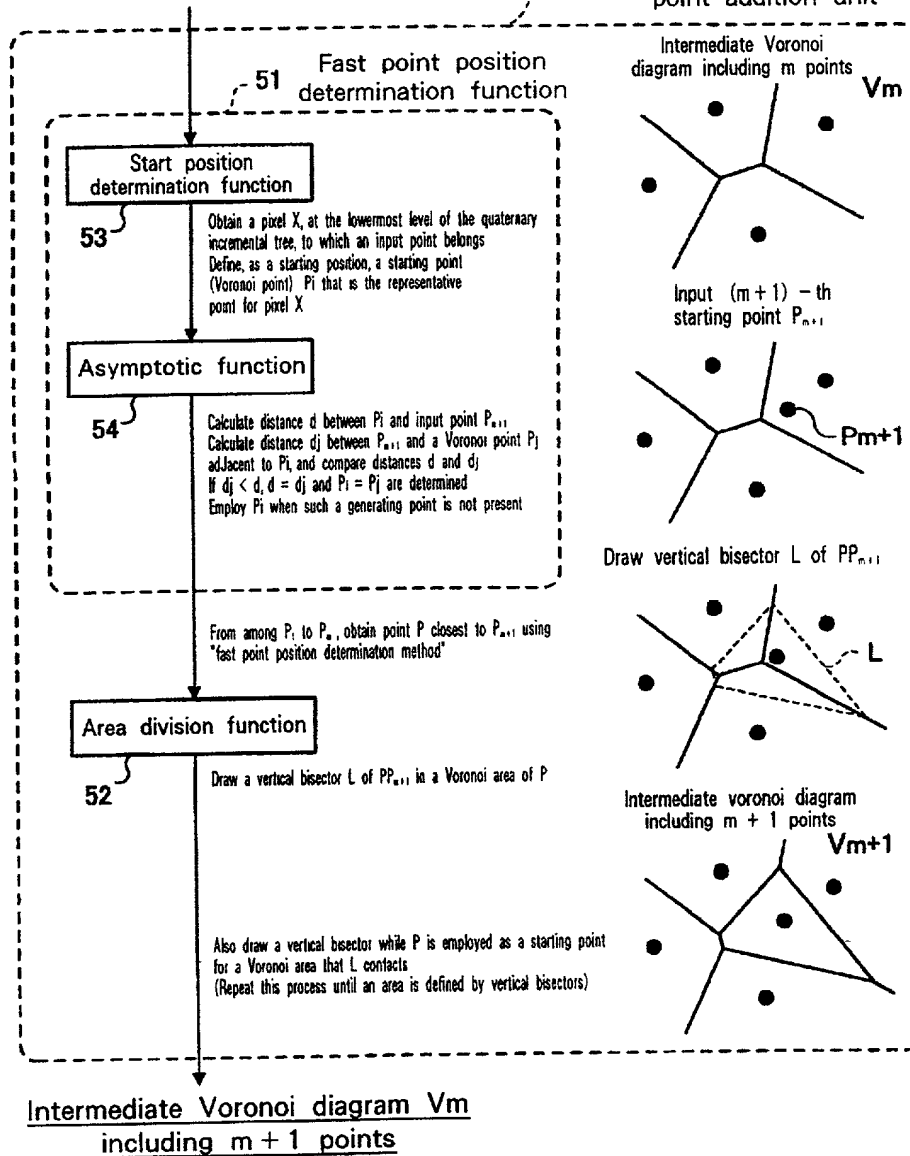


Fig. 15